

ABSTRACT

An on demand vehicle drive system monitors vehicle performance and operating conditions and controls torque delivery to the vehicle wheels. The system includes a plurality of speed and position sensors, a transfer case having primary and secondary output shafts driving primary and secondary axles and a microcontroller. The sensors include a vehicle speed sensor, a pair of primary and secondary drive shaft speed sensors, and brake and driveline status sensors.

The transfer case includes a modulating electromagnetic clutch controlled by the microcontroller which is incrementally engaged to transfer torque from the primary output shaft to the secondary output shaft. When the speed of either the front or the rear drive shafts overruns, i.e., exceeds, the speed of the other drive shaft by a predetermined value related to the vehicle speed, indicating that wheel slip is present, clutch current is incrementally increased to increase clutch engagement and torque transfer to the secondary axle. When wheel slip is reduced below the predetermined value the current to the clutch is incrementally reduced. The method of operating such a system is also described.